THE PREVALENCE OF CONSUMPTION IN LARGE TOWNS, AND HOW TO DIMINISH IT.

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WHEN the Committee of the Manchester and Salford Sanitary Association did me the honour of asking me to give one of the lectures in the series of "Health Lectures for the People" I chose as subject, "Pulmonary Consumption, and its Prevalence in Large Towns," for I have for years been impressed with the importance which this subject ought to have to the public at large. When we see the number of sufferers from chest disease who crowd daily the out-patient rooms of our public hospitals and dispensaries, all of them with the stamp of that disease in their features which carries off so many annually, the conscientious physician will naturally ask himself the questions, Whence arises this excessive prevalence? and can nothing be done to check it? Sanitary legislation has done much for the protection of infant life, and it is doing all it can to prevent the spread of infectious disease, but has it exerted itself in an equally meritorious way in order to bring about a diminution in the number of deaths from consumption? We shall see in the course of this lecture that much remains to be done on this score; but we shall also see that the prevalence of pulmonary disease does not rest alone with the want of provision made by the sanitary authorities, but that a great deal can be done by each individual by a proper observance of the ordinary laws of health; and I trust that the few observations I have to make will—I do not mind in however small a measure—be productive of some good in this direction.

Lest you should think that I am exaggerating, I will just draw your attention to one of the diagrams, where you will see that the number of deaths from diseases of the respiratory organs in England is frightfully large. Thus—

Year.	Diseases of Respiratory Organs.	Phthisis.
In 1866	77·249	53·714
In 1876	90·034	51·775

Or, what will be more startling, 1 death in 4 is due to disease of the lungs (bronchitis, pneumonia, or phthisis). If we now take Manchester, we find that the proportions of death from chest affections are still greater, for annually more than 2,500 persons die from diseases of the respiratory organs, while more than 1,000 die from phthisis, or consumption proper.

Next, a few figures will show that the mortality in towns from diseases of the respiratory organs is much greater than in the country. Thus, in Westmoreland (during 1869-73) the average death-rate from diseases of the lungs was only 2·27 per cent, while in the registration district of Manchester it was 7·7, or more than three times as great. These figures speak for themselves, and I need not weary you with giving further statistical proofs of the frightful mortality from diseases of the lungs in large towns.

We will now inquire into the causes which operate to bring about such a great mortality. It will impress you, I think, more forcibly how important some of those causes are if I very briefly tell what is the normal function or work done by the lungs, our respiratory apparatus.

The lungs are two elastic hollow bags, with many thousand small compartments, called air-cells, and are situated in the chest. During life these bags are continually in action. They alternately expand and contract, just like a pair of bellows, and they do their work independently of our will. With every expansion of the lungs a quantity of air is sucked in, or, as it is called, inspired, and with every contraction a quantity of air is expelled or expired. What is this alternate expansion and contraction for, without which we could not live? I have told you that the lungs are bags divided into many thousand compartments. If we look at one of these compartments we find it is composed of a thin membrane, which on the one side, that side which receives the air, is covered by a layer of very fine cells, and on the other side has running along a number of small tubes in which blood flows. We have thus a little bag filled with air, and on its outer side are a number of small pipes containing blood.

We must now go a step further. In the chest, where the lungs are situated, we have also placed another important organ, the heart. The heart, just like the lungs, alternately contracts and expands, and with every contraction it sends the blood in two directions. In the first place it sends blood throughout the whole body to supply all the organs with their proper nutritive fluid, the blood; and secondly, it sends the blood, which another compartment of the heart receives, from all parts of the body, and which contains all the effete matter which it has taken up along the whole course, into the lungs. The blood which requires purifying is thus sent with every heart-beat into the lungs, and there the process of purification is carried out in a perfect and wonderful manner. When the blood has arrived on the outside of the lung membrane an active interchange goes on between the blood on the one side and the air in the lungs on the other. The blood takes from the air in the lungs a certain quantity of a gas called oxygen, which renders the blood pure, and thereby enables the tissues and organs of the body through which it passes again to perform their functions; and the blood gives to the air in the lungs its waste material, which consists of another gas called carbonic acid gas, which is a poison, and in which no animal can live. With every inspiration we draw in air rich in oxygen, which passes into the blood, and with every expiration we breathe out air which contains a large proportion of carbonic acid, which the lungs receive from the blood, and which they pass out. There is, therefore, a great difference between the air we breathe in and the air we breathe out. This I am able to show you with the help of a single experiment. (Experiment.)

You will thus see that we have several important factors to consider. In order that the lungs should remain healthy and perform their important functions well we must have—

1. The air which we breathe pure and rich in oxygen.

2. We must have the blood of such quality as to be able to draw the proper amount of oxygen from the air which it finds in the lungs.

3. The membrane, or bag, or lung tissue proper, must be in such a condition as to allow this interchange of gases.

If one or other of these elements or factors is in an unhealthy condition disease will be the result, and though there are many different varieties of chest disease the ultimate result will in nearly all cases be the same, the health will gradually be undermined, and all the symptoms of chest disease will be set up, and the individual will gradually sink from what is known as phthisis or consumption.

In considering these several factors we will leave out No. 3, for it would lead me too far away from the subject. It would be more fit for a medical audience. Suffice it to say that many cases of so-called hereditary consumption are due to this cause. You, I dare say, all know that consumption is hereditary, and that there are cases where, in spite of all precaution on the part of the individuals—where, in spite of all the favourable external circumstances under which the person may live—consumption sets in, and causes its fearful ravages. These, as a rule, are cases where one or other of the parents have died from the disease, and in these cases we have an inherent tendency to disease in the third of our factors, in the lung tissue itself.

Much more important to us are the other two factors. As regards the first, we have to consider several points. The air becomes vitiated in several ways, but this is chiefly the case in large towns. We will consider some of them.

1. Trades and manufactures pollute the air, some trades much more so than others. Thus there is a certain form of consumption known as knife-grinder's phthisis. This is a form of consumption very prevalent among the grinders of Sheffield, Birmingham, and other towns. The *modus operandi* is here very simple. Extremely fine particles of iron dust and other matter are inhaled with the air, irritate the lining membrane of the lung, and lead to different forms of lung disease, which sooner or later end fatally. The same applies to other trades, such as stonemasons, cotton and weaving operatives, and so on. To obviate the evil resulting from these particles fans have been constructed, with the object of blowing away the dust from the mouths of the workmen; but these appliances have not met with much favour, and are consequently very little used.

2. Apart from these particles, intimately associated with these different trades, we have in large manufacturing towns another great cause whereby the atmosphere becomes vitiated, which cause not only affects those engaged in factories but affects also the community at large, viz., the presence of noxious vapours and gases. I think we have abundant evidence of this in our own city; and every one must have felt the oppression which is experienced on coming from the country into the city, where the

smoke and the noxious vapours in the air make the act of breathing almost a labour.

3. Equally deleterious and equally prevalent in large towns is the presence of substances in the air due to putrefaction. Under this head we should have to consider the exhalations from sewers, from our polluted rivers, and from the heaps of refuse which are allowed to putrefy in open defiance of all sanitary laws. We have still in Manchester and Salford, and other large towns, a number of so-called back-to-back houses, closed courts, &c., where animal matter is allowed to decay, thus poisoning the atmosphere, and making it utterly unfit for breathing purposes. These putrefying masses exert a particularly hurtful influence on the inhabitants, for they produce infectious diseases, debilitate the system, and are certainly productive of lung disease. This latter fact has been clearly demonstrated by experiments on animals which were made to breathe an atmosphere contaminated with products of putrefaction, with the result of producing in them tubercular lung disease, one of the worst forms of the so-called phthisis.

4. We now come to another, and perhaps the most important, cause in the production of lung disease from a vitiated atmosphere, that is the closed and stuffy air due to a want of proper ventilation. Nothing is more injurious to the lungs than the breathing of air which has already been breathed, and that is exactly what is done when a number of people remain for a length of time in a room or space where there is no proper ventilation, or, in other words, where the current of air is not constantly being renewed. I have already spoken of the air we breathe out, and the quantity of carbonic acid it contains. I can show you by another experiment how poisonous is the air we expire or breathe out. (Experiment.)

In the experiment which I have just performed the candle was extinguished by the carbonic acid, which does not support combustion. The expired air, however, contains, besides this poisonous gas, many organic particles, which act quite as injuriously as the exhalations from sewers. These can be seen by breathing on a glass slide, and then examining the deposit with the microscope, as it has been done by my friend and colleague, Dr. Ransome. Few, of course, at once see how these facts which I have just stated apply to the subject under discussion—namely, the production of pulmonary disease—for they mean, in other words, that the crowding together of many people in ill-ventilated rooms is productive in the highest possible degree of lung disease. It is important to bear this in mind, for the air thus rendered noxious does not indicate itself to us by a bad smell. In fact such a room is called "warm and cozy," and yet it swarms with poison. To show you that I am not exaggerating I will quote from Dr. Richardson's book on the hygienic treatment of consumption. He says, "In all cases of consumption the attention of the physician should be at once directed to the quality of the air breathed by the patient. It may seem dogmatical, but it is true, that in an atmosphere containing 1-100th of carbonic acid (of the breath) a consumptive patient, though in the earliest stage of disease, cannot possibly recover under any form of medicinal treatment, while in those predisposed to the disease the inhalation of such an atmosphere, even at intervals, will add materially in inducing the first symptoms of disease." Further on Dr. Richardson again says, "In large cities, and even in small towns, it is next to impossible to get a constant supply of pure air in inhabited houses, for houses are built according to false notions of comfort. 'What a nice cozy room!' is a common expression, applied innocently to every place where the greatest care has been taken to make an air vault without a draught, and all ready for being charged with invisible impurities."

The remedy for this cause of consumption, though an easy one in the country, becomes much more difficult in towns. In a country place we open a window and allow the pure air to come in, while in large towns like our own we must choose between two evils, either shut out the air from our rooms, and breathe the air vitiated by our own lungs, or admit into the room the air contaminated by smoke and noxious vapours. Now, like a wise man, we choose the least of the two evils—in this case the smoky outside air. It is important that, in spite of fogs, cold, and rain, we look to have our rooms by day and during night properly ventilated.

5. Lastly, we have another agent in the air which, when found in large quantities, produces, or assists in producing, lung disease, and this is moisture or water in the form of gas, or, as it is called, aqueous vapour. Absolutely dry air is not the very healthiest air to breathe, and a certain quantity of aqueous vapour is beneficial, but large quantities are injurious. These large quantities are present in the air which we expire. This is often seen in rooms crowded with people, and where ventilation is deficient. In such cases the aqueous vapour is seen deposited on the windows in the form of a thin film of dew. In much larger quantities, however, do we find this aqueous vapour in damp dwellings. It is here where the seeds of consumption, and of many other ailments, such as rheumatism and debilitating diseases of the system, are laid.

Fortunately the most typical example of such damp dwellings are now rapidly disappearing from our large towns, thanks to the energy of the Sanitary Committee—I mean the cellar dwellings. The amount of disease propagated in these dismal, dingy, foul-smelling habitations is frightful, and I am, therefore, glad to be able to say that before long these dens of disease will belong to the past.

I have very rapidly and very imperfectly sketched to you the different agents which contaminate our atmosphere, and render it unfit for breathing purposes, and which are instrumental in bringing about disease of the lungs, besides a host of other ailments. If we just briefly enumerate the different impurities found in the air of large and manufacturing towns, we have—

1. The fine particles of iron, dust, stone, and fibre, thrown off in the process of manufacture of different articles, and affecting the health of those engaged in such manufactures.

2. The presence of large quantities of smoke, containing noxious gases, affecting the health of the country.

3. The presence of organic matter, due to putrefaction, arising from deficient drainage, exhalations from sewers, and the putrefaction of heaps of refuse.

4. The air vitiated by respiration, as experienced by people who live crowded together in badly-ventilated rooms ; and lastly,

5. The air containing too much aqueous vapour, and found in damp dwellings.

Now in spite of sanitary reform, which has already affected much good, several of these causes are still in operation in this town, and we cannot therefore wonder at the great mortality from diseases of the respiratory organs in this town, especially when we consider the inclemency of our climate and the sudden changes of temperature, which are so fruitful a cause of our catching cold, whereby so often the membrane lining the lungs becomes irritated, and thus rendered particularly predisposed for the development of lung disease.

We will now go back again to the constituent part of the lungs. We saw that the lung membrane was in contact on the one side with air, and we have just seen how that air is rendered unhealthy; we saw also that on the other side of the lung membrane we have blood contained in little vessels; and we will now consider what part changes in the blood play in the production of lung disease.

The blood is a fluid, when looked at with the naked eye, but when looked at under a high magnifying power it is found to contain a number of small dics called blood corpuscles, of which there are two varieties—the red ones, by far the most numerous, and the white ones, and which in healthy blood are found in the proportion of one white one to 400 red ones. The red blood corpuscles take the oxygen out of the air in the lungs and carry it to all the tissues, where it assists in the performance of all the functions; from the tissues these red blood corpuscles take the waste product, or one of the waste products, and bring it back again to the lungs, where the carbonic acid is exchanged for the oxygen, the carbonic acid appearing, as we said, in the air we breathe out. Besides the red and white blood corpuscles the blood contains a highly albuminous fluid, the plasma, and the blood serum—fluids which resemble in properties and in constitution the white of egg—and these likewise supply the tissues with nutritive material. Now the richer the blood is in red corpuscles, and the richer the blood is in albuminous bodies, the more vigorous will be the process of oxygenation in the lungs and the nutrition of the tissues. The blood itself, however, is elaborated from food, and hence the quality of the food we take influences the quality of the blood, and in this way influences respiration and nutrition. Food may be divided into two kinds—food rich in albumen, which helps to build up the tissues and supply muscular force, and food rich in starchy, fatty, and sugary matter, which assists in our maintaining the bodily heat. The food which contains all these principles is milk, that which contains them all except fat is bread, and white of eggs and meat represent food rich in albuminous matter. It will be at once seen that in respect of food too, just as was the case with air, the bulk of the population in large towns is at a disadvantage, compared with the population in the country. Of the four principal articles of food, eggs and meat are high in price, and therefore not within the reach of the poor, while milk and bread are not unfrequently adulterated, and thus deprived of some of their nutritive properties. It is the purity and richness of the milk which is very important, and bears, though indirectly, on the subject before us, for milk should form and does form the chief food for children. Now, imperfect nutrition, due to bad unwholesome food, is in children a frequent cause in the production of scrofulous disease, and the scrofulous disease in children very often developes into phthisis in the grown up.

Besides air and food, we have other causes predisposing to lung disease, as seen in inhabitants of large towns. I will mention some of them.

1. *The Want of Outdoor Exercise.*—How many hundreds of persons are there living in this town who are engaged in sedentary occupations, working from 10 to 12 hours a day, and breathing all the time vitiated air, and whose only outdoor exercise consists in walking to and from their work? and how many of these are doomed to die of consumption, brought on entirely by their occupation and want of exercise? The register of our hospital out-patients could give a startling answer to this question. The value of exercise is indeed manifold. Exercise checks the waste of muscular structures, for muscles left inactive undergo a consumption, without any necessity for a lung disorder (Richardson, p. 24); exercise causes a more brisk circulation through the lungs, and a free distribution of the blood through the system at large; and exercise induces a more free respiration. But in order that exercise should produce all these good effects it should take place in pure air, and should be of such a nature as to affect, if possible, all muscles equally. Exercise in which only one group of muscles is concerned does not produce these good effects, and hence the continuous, strained, and one-sided exercise of persons employed in manufactures is not only not useful, but often injurious, viz., the stooping position of miners, and so on.

2. *Irregular Habits and Late Hours.*—There can be no doubt that people in towns live altogether an artificial life. After a day of work the body and mind require rest. Such rest need not be absolute rest, but could with advantage be modified with ennobling pleasures; but those pleasures, to quote a high authority, "are with difficulty attainable without injury to health. The theatre is an unventilated oven; the lecture-hall is often cold and charged with unremoved air; the concert-room is like a lighted-up and gilded black hole." In this respect, too, our country cousins, though apparently at a disadvantage socially, are from a hygienic point of view better off than ourselves. Irregular habits and late hours bring along with them another great social evil, especially prevalent in towns, and that is to take alcoholic drinks in excess. The excessive use of alcohol, however, by itself, is a very fruitful source of pulmonary affections. Dr. James Clark even goes so far as to state that the abuse of alcohol is one of the most fruitful causes of phthisis. Other authorities are of the same opinion. I must certainly say, from my own experience, that alcoholism produces very often a chronic catarrh of the lungs, which eventually leads to phthisis. Nor does the evil influence stop here, for it is well known that the offspring of parents who have been habitual and

heavy drinkers, are often the subjects of phthisis, tuberculosis, and scrofula. In the course of an inquiry on the causes of consumption, Dr. Bowditch, the President of the Board of Health in the United States, sent circulars to 210 medical men, asking them to state whether in their opinion alcoholism caused phthisis. Of the 210 appealed to 109 answered in the affirmative, while 13 were inclined to the same view. To the question whether phthisis in children could be traced to the drinking habits of the parents, 100 answered yes, and 19 were undecided. I might now mention some further causes, but I think these will suffice to show that living in a large town like Manchester we have very great facilities offered for becoming consumptive.

The next question which we have to ask is, How can some of these causes be obviated? for all those which I have stated are preventable causes. The remedies are many—many of them lie with the individual, some with the community.

One remedy obviously is to have as large a supply of pure air as possible. Very few, of course, can afford to live out of town, where this commodity can easily be had. Those who reside in town must look to the proper ventilation of their workshops and dayrooms, as well as their bedrooms, for we have already seen that the atmosphere outside our dwellings is by far better than the close and vitiated air of our rooms. A very good practice, therefore, is to have some portion of the window of an apartment open both day and night. This must be done, however, so as to avoid the draught—that is, large volumes of air entering with great velocity. Perhaps the simplest contrivance is to affix a finely perforated zinc plate to the top part of the window, which is to be kept open. The air in this way enters through the very small holes, which keep particles of dust out. The small openings also break the force of the air current and prevent draught. The adoption of such mode of ventilation I therefore recommend to all.

The second remedy lies in our procuring good and wholesome food, and the avoidance of alcohol in excess. The number of temperance preachers is already very great, and I will, therefore, say but little on this subject. I will merely refer you to the statements I have made above, and which clearly show that intemperance is a fertile source for the development of consumption.

The third precaution lies in our taking as much outdoor exercise as time will permit. Walking, rowing, gymnastics, are all excellent in their way.

Pulmonary consumption is a slow and insidious disease, and attacks the weak and debilitated, and it is therefore of the greatest importance to look to the health of the children besides looking to our own. The great measures which we are to adopt here are, a good supply of food, fresh air, active exercise, warm clothing, frequent bathing, and, if possible, to choose for them, when they grow older, a healthy occupation. It is astonishing how many mistakes are made in this respect. If the child is weakly it is sent to a tailor or shoemaker, to a clerk's office, or a draper's shop, while, on the other hand, an outdoor occupation, even if more laborious, would be less detrimental to the child.

It is thus seen that much can be done by the individual to avoid the deadly enemy, *i.e.*, pulmonary consumption. Other measures, however, must be looked to and taken in hand by the town authorities; and I am glad to say that our own town authorities are alive to this fact. Amongst the measures, I may mention—

1. The purification of our river.
2. The supply of pure water in sufficient quantities.
3. Proper supervision of factories and manufactories, both as regards the smoke evolved and the ventilation of the rooms.
4. The abolition of all open ashpits and appendages.
5. Proper system of drainage.
6. The abolition of all cellar dwellings.
7. The proper supervision of all lodging-houses as regards cubic space of air allowed to each lodger, and the ventilation in the sleeping apartments.
8. The establishment of large and open spaces, ornamented by plants and trees, in the midst of densely-populated districts.
9. The establishment of public gymnasia in covered-in buildings, &c.
10. Facilities given to working men to live in the suburbs. This could be effected by building large numbers of cottages, at a very moderate rental, in the suburbs, and establishing tramways, where, at a very moderate cost, workmen could be taken to and from their places of occupation. I confess I am not very sanguine as to seeing this last suggestion speedily carried out, owing to the great depression of trade. Good times, I hope, however, will be soon again in store for us, and with the renewal of trade I hope to see some such measure feasible.

One word more and I have done. Consumption is by no means always a fatal disease, and many cases, especially when early attended to, can be cured. What provision have we in this large town for curing such cases? The provisions here are indeed lamentably defective. We admit consumptive people freely to our out-patient rooms, and supply them freely with medicine and cod-liver oil, but in return for this they have to sit for hours in their damp clothes, in dark, dismal, badly-ventilated waiting rooms. Into the hospital, as in-patients, cases of consumption are not admitted, and this rule is a wise and necessary one, for the hospital is too small, and its situation such as not to be of much benefit to the diseased lungs. Nor are large hospitals the proper abodes for persons affected with pulmonary disease. What we require is the establishment in the country of small detached cottage hospitals. In this view I am supported by no less an authority than Dr. Richardson, who says, "The special hospitals for consumption should be little colonies, situated far away from the thickly-populated abodes of men, and they should be provided with pleasure grounds of great extent, in which the patients could pass every possible hour of the day, and with glass-covered walks overhead, where the open air could be freely breathed even if rain be falling. Very expensive such establishments would be, yet it would be infinitely more advantageous to treat ten patients in this manner than ten tens in a confined brick and mortar box."

I will not detain you any further. I have tried to point out to you the chief preventable causes, and I have briefly mentioned to you how to obviate them, and if I have succeeded only in showing you how important pure air, good food, healthy exercise, and regular habits are, the hour which we have spent together this evening will have been spent not unprofitably.